Primer on Communications Technology

3rd Annual Statewide Partners' Conference

Milwaukee, Wisconsin

September 12 -1 3, 2005

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State Expert Panel on Communications

In accordance with directives from both the FY 2005 HRSA and CDC Cooperative Agreements, each hospital and local health department (LHD) is to have communications redundancy

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Recommendation: 4 Tiers of Redundancy

- Landline Telephones
- VHF/UHF Radio
- Satellite Telephone
- Amateur (HAM) Radio

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Baseline Recommendations

- The recommendations by the State Expert Panel are baseline recommendations
- The Panel recognizes the availability of communications technology and staff with communications expertise varies at hospitals and local health departments
- Each hospital and LHD is to adapt these recommendations to their unique environment

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Introduction

- This presentation is only an introduction to these communications recommendations
- 2 full day seminars on these recommendations will be held in October
  - October 11, Madison
  - October 12, Wausau
- Topic Experts will go over each recommendation in detail

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Multiple Options

- Each recommendation can be implemented through multiple options
- Each hospital and LHD will need to consider the operational and financial impact of these various options

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Tier 1: Landline Telephones and Cell Phones

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Landline Dependent Technologies

- Telephones (corded and cordless)
- FAX
- Landlines to Cell Phones
- Cell Phones to Landlines
- Dial-Up and DSL Internet

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Landline Dependent Technologies

- Dial-Up and DSL Email
- Voice Over IP via Dial-Up or DSL
- T1 (or higher) Lines

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T1 (or higher) Lines

- These are dedicated landline circuits and are used, especially by hospitals and LHDs, for dedicated data access
- They are more likely to get overloaded at the Server or beyond, when many users are trying to access a site such as the HAN

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T1 (or higher) Lines

- Since these lines are dedicated circuits, they are not shared outside the organization
- They can become inoperable due to damage, but overload can be prevented by internal usage policy
- T1 lines allow for 24 talk paths (48 users)
  - part can be used for Internet
  - part for voice communication

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Why Do Landline Circuits Get Overloaded?

- System is built for 18% capacity
- Assumption: at any given moment less than 18 of 100 users are on the telephone
- Circuits were at capacity in New York City on 9/11
  - Events such as Mother's Day (busiest calling day of the year) and snow storms can overload circuits

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Cell Phones and Landlines

- Cell phones use landlines when
  - a cell phone calls a landline
  - a landline calls a cell phone
- If landline circuits are busy or down, then cell phone calls to landlines and/or landline calls to cell phones may be busy or down, since the cell phone is using part of the 18% landline capacity

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Cell Phone to Cell Phone

- If landlines are down, cell phones may still call cell phones (assuming towers are functional)
- Cell phones are built for 18% capacity
- When this capacity is reached, the cell circuits are overloaded
- Extended power outages can exhaust back-up power supply at cell towers
- Technologically, Blackberries are the same as cell phones

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Expert Panel Recommendations

1. All hospitals and LHDs are to identify personnel that fulfill critical functions and what communications technology they are to have available.
2. All hospitals and LHDs are to have landline capability for critical functions
3. All hospitals and LHDs are to have FAX capability for critical functions

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Expert Panel Recommendations

4. All hospitals and LHDs are to have cell phone capability for critical functions

5. All hospitals and LHDs are to have T1 lines for high speed access to the Internet

6. All hospitals and LHDs are to have partial use of T1 Line for voice communication

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Expert Panel Recommendations

7. All hospitals and LHDs are to have an internal policy to manage use of T1 lines when necessary

8. All hospitals and LHDs are to have email capability for critical functions

9. All hospitals and LHDs are to have Internet access for critical functions

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Expert Panel Recommendations

10. All hospitals and LHDs are to have dedicated telephone lines (POTS) for critical function areas

11. Each dedicated line is to include the telephone number clearly marked on the instrument along with instructions on how to dial.

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Power Outage

- Most landline and cell phone companies have emergency power backup
- Remember any cordless telephone will need a battery backup in order to be used in a power outage (the base needs electrical power to operate)

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Expert Panel Recommendations

12. All hospitals and LHDs are either not to have cordless phones for critical functions or to have emergency power/battery backup for cordless telephones

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Cable Internet

- Cable is dependent upon electrical power
- Cable can be damaged physically
- Cable Internet can continue to be accessed even if landlines are down or overloaded

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Expert Panel Recommendations

13. Hospitals and LHDs that use cable for Internet are to have discussions with their cable provider about what back-up systems are available.

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Satellite Internet

- Satellite Internet is dependent upon electrical power
- Satellite Dish can be physically damaged, interfered with by sun/weather, or susceptible to landline problems
- Satellite Internet can continue to be accessed even if landlines are down or circuits are overloaded

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Email and Internet

Dial-Up and DSL Email and Internet depend upon landlines and thus are subject to overload and physical damage

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Expert Panel Recommendations

14. The Expert Panel does not recommend satellite as a redundancy for Internet access

Note: It is planned that a HAN server will be located in a remote location to serve as a back-up to the Madison server.

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Physical Damage

- Besides being overloaded, cell phones, landlines and T1 lines can be damaged physically:
  - "digging in your garden"
  - "blowing up the switching station" intentionally, such as by a terrorist attack
  - "blowing up the switching station" unintentionally, such as by a tornado or an accident

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G E T S

- "Government Emergency Telecommunications Service"
  - GETS provides emergency access and priority processing
  - hospital or LHD provides critical functions with GETS access cards
- GETS can be accessed, if there is a dial-tone

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How GETS Works

- You call the GETS toll free number and enter your PIN
- GETS (transparent to you) connects you to MCI, Sprint or AT&T (alternate numbers are also available if these are not your LD carriers)
- On 9/11 18,000 GETS calls worldwide were made with a 95% completion rate
- GETS, not just for long distance, is also extremely useful for local congestion and damage

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Cost for GETS

- No activation or monthly fee
- $0.075 or $0.10 per minute (dependent upon your carrier)
- A GETS account must be established

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W P S

"Wireless Priority Service"
- the wireless complement to GETS
- calls are queued for next available radio channel by calling *272
- hospital or LHD provides critical functions with WPS access cards (same as the GETS card)

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W P S

- WPS is available in Wisconsin through Cingular, Nextel, T-Mobile
- Sprint and Verizon are scheduled for WPS in early 2006
- If landline networks are congested, dialing *272 + GETS toll free number will give you priority on both wireless and landline networks

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Cost for WPS

- $10 activation fee
- $4.50 monthly fee (cap only; may be lesser dependent upon your carrier)
- $0.75/minute airtime charge
  - use of WPS does not count against your plan minutes

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Expert Panel Recommendations

15. All hospitals and LHDs are to have GETS and WPS access for critical functions

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T S P

- "Telecommunications Service Priority"
  - Telephone companies are mandated by TSP to prioritize service requests for TSP subscribers
  - There is an annual cost associated with this service
- Telephone companies usually work with local authorities to prioritize repairs

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Expert Panel Recommendations

16. All hospitals and LHDs are to consult with telephone company about repair priority. Depending upon the priority, the hospital or LHD may consider getting TSP.

Note: There is a cost associated with TSP. For further information go to **http://tsp.ncs.gov/**

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What Does the Telephone Company Use for Redundancy?

- Cell Phones
- VHF/UHF Radio
- HAM Radio

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Tier 2: VHF/UHF Radio

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Understanding Radio Communications

- "If you understand two tin cans and a string, then you understand radio communications"
  - One receiving and one transmitting unit
  - Signal sent over the airwaves (the string)
  - Only one person can talk at one time
  - The limitations of communicating using two tin cans and a string

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What Is Radio Communications?

- The ability to talk over the airwaves:
  - Simplex: one radio unit communicates with another radio unit on a single frequency
  - Duplex: multiple radio units can communicate with multiple radio units through a "repeater" system, using two frequencies (listen and transmit frequencies are simultaneous)
  - "Repeater": a tower that picks up a signal from a radio and transmits it to another radio

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What Bands Are Used?

- VHF
- UHF
- 800 MHz
- 900 MHz (cell phones)
- Microwave

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Who Uses Radio in Wisconsin?

- Radio is mostly used by Public Safety:
  - Law Enforcement
  - Fire Departments
  - Hospitals
  - Emergency Medical Services
  - Emergency Management
  - Public Health
  - Government
- Businesses (such as utilities) also use radio

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Who Can Use Which Frequencies?

- Each Public Safety discipline is pre-assigned a specific frequency. For example:
  - 155.475 Law Enforcement
  - 154.295 Fire
  - 155.340 EMS
- See the EMS Communications Plan for complete details on which frequencies EMS and hospitals are to use

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What Is a Trunking System?

- A trunking system is a digital system (computer operated)
- Think of a line in a Bank:
  - all people stand in one line
  - you go to the first Teller available
- A trunking system pools all frequencies and makes the line that is open available to the first user (system is transparent to the user)

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Advantages of Radio

- Allows for a large number of users
- Ability to communicate with many users at once (broadcast capability)
- Inexpensive upfront costs and minimal recurring costs
- Easy to operate (push-to-talk)
- Independent of other communication systems
- Fairly easy to learn

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Disadvantages of Radio

- You cannot "ring" someone (some systems have this capability)
- Range is limited by power, terrain, system design
- Battery life is limited for hand-held radios

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Disadvantages of Radio

- Limited number of frequencies and talk groups (radio frequencies are shared)
- Unauthorized use of frequencies
- Communication is not secure (encryption requires additional equipment)

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Interoperability

- There are very few, if any, interoperability problems with a telephone
- You simply pick up any telephone, anywhere, dial the number and you can communicate
- Interoperability is not that easy with radios

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Interoperability Problems

- Users of radio choose one or more of the bands:
  - with different frequencies available
  - with different equipment available
- Creating many problems for users in communicating with one another

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Interoperability Problems

- Users have different radio systems
  - one system works well in one location but not in another
- Different protocols and frequency bands
- Lack of knowledge of who has what frequencies
- Political and "turf" issues

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Interoperability

- Definition:
  - The ability of various groups to talk with one another by radio
  - Requires a plan to know on which frequencies they will communicate
  - Requires equipment that will enable this communication on these frequencies
  - Plan to deal with obstacles to communication (terrain, power, etc.)

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Interoperability Plan

- Resources available to hospitals and local health departments:
  - Matrix for your county that lists radio users and the frequencies they use
- Plan:
  - Hospitals and LHDs to identify key partners that they need to communicate with by radio
  - Identify the frequencies that they will use
  - Develop the same plan for the "collar" counties

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Project 25

- Project 25 (P25) is the standard for interoperable digital two-way wireless communication products and systems
- Developed by state, local and federal governments and Telecommunications Industry Association (TIA)
- P25 is accepted as the standard for public safety, security, public service and commercial applications

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Do Not Worry About P25

- P25 standards are not required for EMS and hospital base stations (unless equipment is being purchased with Homeland Security funds)
- Other public safety agencies do not need to upgrade to P25 for the next 5 – 10 years
- There will be no negative effect upon State EMS and hospitals communications as others become P25 compliant
  - Cost for P25 equipment is 2-3X greater

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Internal Radios

- Radios can be used within a hospital or local health department so that staff can communicate with one another and also with others outside the facility such as law enforcement
- If your plan includes communications with law enforcement, the radio must be capable of transmitting on law enforcement frequencies
- With permission !!!

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"Narrow Band" Project

- The ability to create more frequencies by "narrowing" the band
  - 155.340 (existing)
  - **"155.3475" (created by narrowing the band)**
  - 155.355 (existing)
- IMPORTANT: All radio equipment must be narrow band operational by CY 2013

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Statutory Requirements

- EMS and hospitals are required to obtain an FCC license for operation of a two way radio base station
- All hospitals are required to have the ability to communicate on the State EMS channel so ambulances from any area can make contact with the hospital

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HFS112.07(2)(f)

"…There shall be two way voice communications between every ambulance and the medical control physician, including in addition to a mobile radio in the ambulance, a portable means of communications capable of being operated from the patient's side."

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Expert Panel Recommendations

1. All hospitals are to have VHF two-way radio communication with EMS
2. Any new radio equipment purchased by hospitals and LHDs are to support state-wide interoperability and have access to statewide frequencies
3. Any new radio equipment purchased by hospitals and LHDs are to be narrow band capable

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Expert Panel Recommendations

4. Each hospital and LHD is to complete the Interoperability Plan for its home county.
5. Each hospital and LHD is to complete the Interoperability Plan for its collar counties.
6. Any new equipment purchased by hospitals and LHDs is to have the capability to communicate on all channels, identified by the Interoperability Plan

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Expert Panel Recommendations

7. Each hospital is encouraged to have an additional multi-channel radio to communicate on ALS and EMS Coordination channels

7a. This additional radio is also to have scanning capability

7b. This additional radio is to have access to 155.280 for inter-hospital communications

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Expert Panel Recommendations

8. Each hospital and LHD is to have internal radios so that critical functions can communicate with one another and with others outside the facility (if necessary)

8a. If internal radios are used to communicate with others outside the facility, there must be authorization to use their channel and also agreement on which channel to use

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Tier 3: Satellite Telephone

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Redundancy: Satellite Telephone

- Landline circuits can get overloaded or destroyed
- Cell phones do not work everywhere
- Radios do not work everywhere
- Amateur (HAM) radios: you are dependent upon a non-staff person

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How It Works

- Satellite Phone to Satellite Phone
  - Your call goes from your satellite telephone to the satellite
  - The signal then goes from the satellite to a ground station
  - The signal goes back to the satellite
  - Then the signal is sent to the satellite telephone you are calling

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How It Works

- Satellite Phone to Landline Phone
  - Your call goes from your satellite telephone to the satellite
  - The signal then goes from the satellite to a ground station
  - The ground station then connects your call to the landline network

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Expert Panel Recommendation

- The State Expert Panel on Communication is recommending that hospitals and LHDs purchase the Globalstar GSP 2900 satellite telephone or equivalent (established procurement policies must be adhered to; hospitals and LHDs are free to purchase any Brand)
- This is the same satellite telephone, used by Wisconsin Emergency Management, Homeland Security, FEMA, 120 hospitals in New York and many more

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Benefits

- You can call anywhere in the USA and throughout most of the world without any coverage gaps
- Base stations (48) are in outer space (852 miles up - LEO) and are not affected by hurricanes, earthquakes, landline or cellular overloads
- You can call any other Brand of satellite telephone or any other type of telephone, pager, cell phone, etc.

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Benefits

- System is built for 14% capacity (with every Globalstar customer using the phone right now, the system will not be maxed out)
- You can connect up to 6 extensions to the Globalstar unit (only one line)

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Example

- A hospital could have a satellite telephone extension in
  - Hospital Command Center
  - Emergency Department
  - Medical Director's Office
  - Security
  - Plant Operations
  - Nursing Director

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How Is It Setup?

- The antenna and unit is set up on the roof
- The base unit is tied into an analog line of the PBX system of the hospital or LHD (cable can run up to 700 ft)
- 6 extensions can be set up anywhere in the hospital or LHD, using corded or cordless telephones
  - you can be mobile with a cordless telephone

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Questions About Satellite Telephone

- Storms and rain fade effect: No
- Extension in the basement: Yes
- Voice/signal delay ("as seen on CNN"): No
- Voice Mail: Yes
- Email: Yes
- Transmission of data and documents: Yes

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How Does Voice Mail Work?

- You access your Voice Mail simply by dialing your Globalstar telephone number from any telephone anywhere, inclusive of your satellite telephone
- There is no cost for accessing voice mail

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How Do I Transmit Data?

- A Data Kit must be installed (kit comes with "package" being purchased for hospitals)
- Otherwise, Data Kit is $129
- Your PC is then connected to the Data Kit
- You transmit data and documents by your PC just as you do every day

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How Fast Can I Transmit Data?

- Look at your document on your PC and determine the file size
- You can then transmit:
  - 10K in 10 seconds (1 minute usage)
  - 100K in 100 seconds (2 minutes usage)
  - 1000K in 1000 seconds (17 minutes usage)

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How Do I Access the Internet?

- There is no charge for the ISP connection
- The Data Kit allows you to connect the satellite telephone to your PC
- You then access the Internet just as you do every day

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Can I FAX?

- Optional equipment must be purchased to FAX documents
- Cost is $749
- FAX capability is not necessary with the Data Kit, since documents can be sent by email through the satellite telephone

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Can I Conference Call?

- This service is not currently available
- This capability is coming soon

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What Are the Call Plans?

- Recommended Plan is the "**Liberty 1800**":
  - Cost is $780/year
  - 1800 minutes available annually
  - $0.99/minute for additional minutes
  - Voice Mail at no extra cost
  - Express Data at no extra cost (compresses data for faster transmission)
  - If hospital or LHD has more than one line, all minutes can be pooled

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"Basic Emergency Plan"

- For hospitals and LHDs only wanting the basic capability of a satellite telephone for emergencies
  - Cost is $19.95/month ($239.40/year)
  - $1.95/minute
  - Voice only; no data transmission capability

Note: Other plan options are available

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Communications Insurance

- Whether you choose the "Liberty 1800" at $780 or the "Basic Emergency Plan" at $239.40 plus a per minute cost of $1.95
  - You should consider this cost as "insurance"
- What other means of communications will you have if the landlines and cell phones are overloaded or destroyed?

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Are There Any Other Charges?

- $50 Activation Fee is waived for hospitals
- $250 Early Termination Fee is waived for hospitals
  - These waivers may be available for LHDs

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Is My Satellite Call Secure?

- It is very difficult to intercept a satellite telephone call
- All calls are encrypted
- Weakest link is from the satellite telephone to your landline or from your PC to the satellite telephone (the weak links in your day-to-day communications)

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What About Warranty/Repairs?

- All repairs are done in San Jose, CA
- Satellite telephones are "pretty much like Maytag" appliances
  - There is little to no repair history

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Expert Panel Recommendations

1. All hospitals and LHDs are to have a satellite telephone, capable of transmitting voice, email and data.
2. All hospitals and LHDs are to have satellite telephone capability for critical functions

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Expert Panel Recommendations

3. All satellite telephone extensions are to be cordless telephones with battery-back-up for portability

   Note: Satellite Handheld units may have limited utility in the field

4. All satellite telephones are also to have connectivity to the personal computer of critical functions so that they can email and access the Internet.

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Tier 4: Amateur (HAM) Radio

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Amateur (HAM) Radio

- Most people think of HAM radio as a large metal box with all kinds of glowing tubes (that was yesteryear)
- Today a HAM radio can be as small as a credit card

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Who Uses HAM Radio?

- HAM is a free radio service, authorized by the FCC, utilized by licensed operators.
- HAM radio is used by these operators to assist in emergency situations

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Amateur Radio Emergency Service (ARES)

- ARES consists of licensed amateurs, who have voluntarily registered their qualifications and equipment for communication duty when a disaster strikes
- ARES regions follow WEM regions
  - Each WEM region has an ARES District Emergency Coordinator
  - Each county has an ARES Emergency Coordinator

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Radio Amateur Communications Emergency Services (RACES)

RACES has established dedicated operating frequencies that are to be used in a disaster

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How Far Can HAM Radio Reach?

- A small 5W radio can transmit up to 15 miles
- Using a repeater the same radio can transmit up to 100 miles
- Using shortwave radio frequencies, HAM radios can transmit anywhere in the world

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Redundancy: Amateur (HAM) Radio

- Many hospitals and local health departments already have HAM radio as part of their emergency communications plans
- HAM Radio operators have served in many disasters here in the State of Wisconsin

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How Does HAM Radio Work in an Emergency?

- The hospital or LHD has an MOU with the ARES/RACES team
- The ARES/RACES team provides the hospital and LHD with the operator to assist your facility with communications
- The operator operates the radio; you control the communications

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How Does HAM Radio Work in an Emergency?

- Some hospitals and LHDs have an antenna fixed and available for the HAM operator
- If there is no available antenna, the ARES/RACES team will provide the temporary infrastructure

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Can an Employee Operate a HAM Radio?

- No, the HAM operator must operate the HAM radio
- If an employee has a HAM radio license, he/she may operate the radio, if radio operations are not part of his/her daily job responsibilities

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Expert Panel Recommendations

1. Each hospital and LHD is to include HAM radio as part of their redundant communications plan
2. Each hospital and LHD is to have a MOU with the ARES/RACES team to provide HAM radio services, when requested, in an emergency

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Expert Panel Recommendations

3. Each hospital and LHD is to provide orientation to any new HAM operator regarding his/her responsibilities in an emergency

4. Each hospital and LHD is to involve the Ham radio operator in at least one exercise annually

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Expert Panel Recommendations

5. Each hospital and LHD is to have a pre-designated area in which the HAM operator will work

6. Each hospital and LHD is to have a fixed antenna and power supply for the HAM operator (if applicable)

7. Each hospital and LHD is to consider having a staff person with a HAM radio license

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What's Next?

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Funding for Hospitals

Hospitals have already received
- Phase I: Request for Funding for Satellite Telephone, which must be submitted by September 30, 2005
- Phase II: Request for Funding for Communications Technology, which must be submitted by December 15, 2005

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Funding for Local Health Departments

- Funding has been made available through annual contracts for preparedness, including the purchase of communications equipment
- Funding through the Office of Justice Assistance is also available through your county Emergency Management Director

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Exercises

- Funding from HRSA and CDC will help hospitals and LHDs to enhance their communications CAPACITY
- The CAPABILITY of hospital and LHDs to know who, where, how and when to use these communications technologies comes only through EXERCISE

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Expert Panel Recommendations

1. All hospitals and LHDs are to include use of redundant communications in each exercise (as appropriate)
2. All hospitals and LHDs are to ensure that critical functions exercise the use of communication technologies assigned to them

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Expert Panel Recommendations

3. All hospitals and LHDs are to involve their emergency response partners, at least annually, in a test of the redundant communication systems.
4. All hospitals and LHDs are to have an exercise of their 4 tiers of communications without commercial electrical power.

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Summary

- The purpose of this presentation is
  - to introduce you to the 4 redundant levels of communications technology
  - to introduce you to the communications recommendations
- More detailed information will be presented at the Communications Seminars in October

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